

PATENT
Serial No. 10/032,606 (89190.072901/DP-304631)
Second Response to Final Office Action dated April 13, 2004

Remarks

Applicants respectfully request reconsideration of the present application in view of the above amendments and following remarks. Since the amendments set forth in the Amendment and Response to Final Office Action submitted by the Applicants on June 14, 2004 ("the 2nd Response") were not entered, the above-referenced amendments are being made in relation to the claims as set forth in Applicants' Amendment and Response dated February 2, 2004 ("the 1st Response"). In particular, claims 1 and 16 have been cancelled without prejudice or disclaimer. Claims 2 has been amended to incorporate the limitations of claim 1. Therefore, claim 2 is pending in the present application.

On July 19, 2004, a telephonic interview was conducted by the Examiner Alejandro, Ronald Kisicki, and the undersigned regarding the above-referenced patent application. During the interview, claim 2 was discussed with respect to U.S. Publication No. 2002/0098400 to Mieney ("the Mieney reference").

During the interview, the Examiner stated that new matter was entered in the 2nd Response because the word "areally" appeared in Subsection C of claim 2, which was previously considered indefinite by the Examiner in the first Office Action dated October 31, 2003 ("the 1st Office Action"). See 1st Office Action, pg. 2, ¶ 5. Applicants explained that the word "areally" was inadvertently included in claim 2 as presented in the 2nd Response. See 1st Response, pg. 2 (showing that the word "areally" was deleted from claim 2). As set forth above in the "Amendments to the Claims" portion of the present response, the word "areally" is not included in Subsection C of claim 2. Having made this correction, the Examiner agreed to

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consider the Applicants' substantive arguments regarding the patentability of claim 2 in light of the Mienev reference.

During the interview, there was also a discussion of the Mienev reference with respect to claim 2. In particular, the Examiner identified paragraphs 21, 24 and 25 of the Mienev reference as being relevant to the subject matter in claim 2. Applicants distinguished the present invention from the Mienev reference by highlighting the remarks as set forth below in the present response.

Further, the Examiner also mentioned in the interview that the "said electrical resistance" in Subsection C of claim 2 may lack antecedent basis. Applicants responded by stating that the "resistance to the flow of electric current" as set forth in the preamble of claim 2 provides antecedent basis for "said electrical resistance" in Subsection C of claim 2.

In the Final Office Action, the amendment in the 1st Response was objected to under 35 U.S.C. § 132 because it allegedly introduced new matter into the disclosure. See *Final Office Action*, pg. 2. In particular, the Examiner stated that the following added material is not supported by the original disclosure: 1) (claim 1) "wherein said flow area is generally non-parallel to the flow of said oxygen ions through said cell"; 2) (claim 16) "wherein said area is generally perpendicular to the flow of said oxygen ions through said cell." Claims 1 and 16 have been cancelled, therefore this rejection is moot.

Further, the Final Office Action states that claims 1, 2 and 16 have been rejected under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the written description requirement. Once again, the Examiner stated that the

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following added material is not supported by the original disclosure: 1) (claim 1) "wherein said flow area is generally non-parallel to the flow of said oxygen ions through said cell"; 2) (claim 16) "wherein said area is generally perpendicular to the flow of said oxygen ions through said cell." Claims 1 and 16 have been cancelled, therefore this rejection is moot. Since all of the rejected language is not present in amended claim 2, Applicants request that the rejection of claim 2 be withdrawn.

Claims 1, 2 and 16 have been rejected under 35 U.S.C. § 102(e) as being anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as being obvious over the Mieney reference. As claims 1 and 16 have been cancelled, the rejection of these claims are moot.

Amended claim 2 is directed to a fuel cell for generating an electric current by combining hydrogen and oxygen wherein resistance to the flow of electric current through the cell is non-uniform over a flow area of the cell to regulate the flow of oxygen ions through any region of the cell in proportion to the partial pressure of hydrogen in the region. The fuel cell further comprising an anode, a cathode and a solid oxide electrolyte separating the anode from the cathode. The anode is used to react the hydrogen ions with the oxygen ions, wherein the hydrogen ions are derived from gaseous molecular hydrogen flowing in a first flow path through a first portion of the cell. The cathode provides the oxygen ions derived from gaseous molecular oxygen flowing in a second flow path through a second portion of the cell. Further, the electrical resistance is non-uniform over one of the anode, cathode, and electrolyte.

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By providing a fuel cell in accordance with the present invention, numerous advantages are realized. For example, the non-uniform electrical resistance over the flow area of one of the anode, cathode, and electrolyte suppresses excess oxygen migration and build-up in regions having low hydrogen concentration and correspondingly increases oxygen migration and build-up in regions having a surfeit of hydrogen. See *Specification*, pg. 4, lines 1-3. As a result, destructive oxidation of the fuel cell is prevented and electrical output is increased due to a greater percentage of hydrogen consumption. See *Specification*, pg. 4, lines 3-5.

None of the references of record teach or suggest a fuel cell wherein the electrical resistance is non-uniform over one of the anode, cathode, and electrolyte as recited in claim 2. In the Final Office Action, claim 2 appears to have been rejected for two reasons. First, the Examiner stated that "each fuel cell component presents a varied appearance of electrical resistance patten due to its material composition." *Final Office Action*, pg. 8, lines 8-10; pg. 11, lines 14-15. In particular, the Examiner stated that the construction material of each of the fuel cell components (i.e., anode, cathode, electrolyte) differ from one another, therefore the electrical resistance will be non-uniform due to the change in materials as the electrical current flows through the anode, cathode and electrolyte. See *id.* at pg. 8, lines 5-8.

While the electrical resistance may vary as the electrical current flows through the entire fuel cell (i.e., through the anode, cathode and electrolyte), there is nothing in the Mieney reference that teaches or suggest providing one of the anode (30), cathode (50), and electrolyte (40) with non-uniform electrical resistance. The fact

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that each of the materials may have different electrical resistance characteristics relative to each other due to their material composition does not mean that the electrical resistance of each component, taken alone, is non-uniform. The Mieney reference does not in any way teach or suggest that: 1) the electrical resistance of the anode is non-uniform; 2) the electrical resistance of the cathode is non-uniform; or 3) the electrical resistance of the electrolyte is non-uniform. As such, Applicants respectfully request that the Examiner's first reason for rejecting claim 2 be withdrawn.

The second reason for rejecting claim 2 appears to have been based upon Page 3, lines 17-22 of the Specification of the present invention. *See Final Office Action*, pg. 8, lines 10-13; pg. 11, lines 15-16; pg. 12, lines 1-3. In particular, the Examiner stated that the electrical resistance is non-uniform over one of the anode, cathode and electrolyte because the electrical resistance is inherently higher in areas of the cell having locally low levels of hydrogen than in areas having locally high levels of hydrogen. *See id.* at pg. 8, lines 10-12. Therefore, the electrical resistance of the fuel cell component (e.g., the anode) at the inlet will be lower due to a high concentration of hydrogen, and lower at the outlet due to a lower concentration of hydrogen. *See id.* at pg. 8, lines 13-17.

However, the Examiner's reliance on the Specification of the present patent application is misplaced. The portion of the Specification located on Page 3, lines 17-22 is a summary of the present invention, not an admission of prior art or inherent function of the fuel cell. The present invention as set forth in claim 2 states that the electrical resistance is non-uniform in one of the anode, cathode and electrolyte.

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The non-uniform electrical resistance over one of the fuel cell components is highlighted in the summary of the invention, which states that the "[r]esistance is higher in areas of the cell having locally low levels of hydrogen than in areas having locally high levels of hydrogen." *Specification*, pg. 3, lines 18-20.

The electrical resistance of a fuel cell component (e.g., the anode) is not inherently non-uniform merely because of the hydrogen concentration at a local fuel cell point, as suggested by the Examiner. See *Final Office Action*, pg. 8, line 21; pg. 12, lines 10-11. If this were the case, conventional fuel cells would not suffer from corrosion, which commonly occurs due to partial pressure buildup of O_2 . See *Specification*, pg. 3, lines 1-8. The purpose of the present invention is to make the electrical resistance of one of the anode, cathode and electrolyte non-uniform so that excess oxygen migration and buildup is suppressed in regions having low hydrogen concentration and increases in regions having a surfeit of hydrogen. See *Specification*, pg. 4, lines 1-3. The Mieney reference discloses nothing more than a fuel cell having an anode, cathode and electrolyte without non-uniform electrical resistance. Thus, the fuel cell in the Mieney reference will likely suffer from partial pressure buildup of O_2 and subsequent corrosion, a problem which the present invention intends to solve.

For at least the foregoing reasons, Applicants submit that the Mieney reference fails to teach or suggest every limitation disclosed in claim 2 and requests that the rejection of claim 2 be withdrawn.

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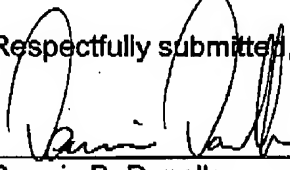
Conclusion

In light of the foregoing, Applicants submit that claim 2 is in condition for allowance and such allowance is respectfully requested. Should the Examiner feel that any unresolved issues remain in this case, the undersigned may be contacted at the telephone number listed below to arrange for an issue resolving conference.

Applicants hereby authorize the Commissioner to charge the \$110.00 fee required under 37 C.F.R. § 1.17(a)(1) for the one-month extension of time, and any other fee that may have been overlooked, to Deposit Account No. 10-0223.

Respectfully submitted,

Dated: 7/19/04


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